

REMARKS

Claims 13-15, 17-29, and 31-35 are pending in this Application. Applicants have amended claim 13 to define the claimed invention more particularly. Applicants have added new claims 33-35 to claim additional features of the invention and provide more complete protection for the invention. Applicants have canceled claims 16, and 30.

An Excess Claim Fee Payment Letter and fee are attached for one (1) excess total claim. It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicants specifically state that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 16 and 30 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. While Applicants completely disagree, to speed prosecution, Applicants have canceled the claims to address the Examiner's concerns.

Claims 13-15, 17-22, 24-29, 31, and 32 stand rejected under 35 U.S.C. §102(b) as being anticipated by Roitman et al. (EP 1003229 A1). Claim 23 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Roitman et al. (EP 1003229 A1).

Applicants respectfully traverse these rejections in the following discussion.

I. THE CLAIMED INVENTION

The claimed invention (e.g., as defined by exemplary claim 13) is directed to an organic electroluminescent (EL) element.

The EL element includes an anode, a cathode, and a light-emitting organic EL layer sandwiched between the anode and the cathode. The organic EL layer includes a leak prevention layer that takes on a high resistance by thermal decomposition when its temperature is increased.

In a conventional EL element, as described in the Background of the present Application, when a voltage is applied between the anode and the cathode, holes are injected into the light-emitting layer via the hole transport layer from the anode or the hole injection layer, while at the same time electrons are injected into the light-emitting layer from the cathode or the electron injection layer. Inside the light-emitting layer, the holes and electrons

recombine to form excitons. Within an extremely short time, the excitons fall to a lower energy level, and some emit the energy difference between the lower energy level and the excited state as light. The light given off within this light-emitting layer is emitted to the side of the substrate or to the side of the cathode. Thus, the organic EL element functions as a light-emitting element (e.g., see Application at page 1, line 23 – page 2, line 7).

However, when there are defect locations in this conventional organic EL element, such as pinholes or partially thinner film thicknesses, then the resistance at those defect locations becomes lower than at other portions, and current (electrons or holes) concentrates at those defect locations. This causes the buildup of Joule heat and increases the strength of the electric field due to such concentrations, thereby causing dielectric breakdown at the defect locations, and ultimately leads to shorts between the anode and the cathode (e.g., see Application at page 2, lines 8-18).

The claimed invention, however, provides an organic EL layer that includes a leak prevention layer that takes on a high resistance by thermal decomposition when its temperature is increased (e.g., see Application at page 16, lines 23-25).

This feature is important because when this type of organic semiconductor is heated to a high temperature, it thermally decomposes and takes on a high resistance. With these materials, it is possible to form films by vapor deposition, which can decrease defects such as pinholes and improve its step coverage by subjecting it to a heating treatment (e.g., see Application at page 16, line 26 – page 17, line 6).

II. THE PRIOR ART REJECTIONS

A. The 102(b) Roitman et al. reference rejection

The Examiner alleges that Roitman et al. teach claims 13-15, 17-22, 24-29, 31, and 32. Applicants respectfully submit, however, that the alleged reference does not teach or suggest each and every feature of the claimed invention.

That is, Roitman et al. do not teach or suggest, “*wherein said organic EL layer comprises a leak prevention layer that takes on a high resistance by thermal decomposition when its temperature is increased,*” (emphasis added by Applicant) as recited in claim 13.

The Examiner alleges that Roitman et al. teach the claimed EL layer. Specifically, the Examiner attempts to analogize a layer of Roitman et al. to the claimed prevention layer.

Roitman et al. relate to a structure for improving reliability of organic and polymer

luminescent device. Roitman et al. disclose an organic EL element comprising and ITO anode 102, a cathode 108, and teach an organic stack 109 sandwiched between the anode and the cathode, wherein a current self limiting (CSL) structure 105 made of a positive temperature coefficient material, such as BaTiO₃, is adhered onto the ITO anode 102 beneath the organic stack 109 (paragraphs [0027-0032]; Fig. 2).

Roitman et al., however, are silent about, and fail to teach or suggest, the use of a material that takes on a high resistance by thermal decomposition, as recited in the claimed invention. This feature is important because when this type of organic semiconductor is heated to a high temperature, it thermally decomposes and takes on a high resistance. With these materials, it is possible to form films by vapor deposition, which can decrease defects such as pinholes and improve its step coverage by subjecting it to a heating treatment.

Thus, instead of teaching or disclosing, “*wherein said organic EL layer comprises a leak prevention layer that takes on a high resistance by thermal decomposition when its temperature is increased*,” (emphasis added by Applicant) as recited in claim 13, Roitman et al. merely disclose an organic EL element, in which an organic stack is sandwiched between an anode and a cathode. A leak prevention layer that takes on a high resistance by thermal decomposition when its temperature is increased, is missing from the teachings of Roitman et al.

Therefore, the Applicants respectfully submit that Roitman et al. fail to teach or suggest each element of Applicants’ claimed invention. Therefore, Applicants respectfully request the Examiner to reconsider and withdraw this rejection, and pass to allowance claims 13-15, 17-22, 24-29, 31, and 32.

B. The 103(a) Roitman et al. reference rejection

In rejecting claim 23, the Examiner alleges that it would have been obvious to one of ordinary skill in the art to use the teachings of Roitman et al. to make the claimed invention. Applicants respectfully submit, however, that the alleged reference would not teach or suggest each and every feature of the claimed invention.

That is, as set forth above in section A, Roitman et al. do not teach or suggest, “*wherein said organic EL layer comprises a leak prevention layer that takes on a high resistance by thermal decomposition when its temperature is increased*,” (emphasis added by Applicant) as recited in independent claim 13.

Therefore, Applicants respectfully submit that Roitman et al. do not teach or suggest (nor render obvious) each and every feature of the claimed invention. Therefore, Applicants respectively request the Examiner to reconsider and withdraw this rejection, and pass to allowance claim 23.

III. NEW CLAIMS

New claims 33-35 have been added to claim additional features of the invention and to more completely define the invention. The claims are independently patentable because of the novel features recited herein.

Applicants submit that new claims 33-34 are patentable at least because of similar reasons to those set forth above with respect to claims 13.

Furthermore, new claims 33-35 recite, “*a leak prevention layer comprising an organic semiconductor,*” (emphasis added by Applicants) as recited in claim 35, as similarly recited in claims 33 and 34. Using a light-emitting organic semiconductor has the following advantages:

- a. A layer of an organic material can be formed by a relatively simple method such as a printing method;
- b. Since the melting points of organic materials are relatively low, the layer can be formed at a lower temperature. Therefore, the layer can be formed on a resin substrate, or the like;
- c. Organic materials are softer and more flexible than inorganic materials. Therefore, an organic EL element including a leak preventing layer made of an organic material is suitable for producing a “flexible display”; and
- d. In cases where a conductive material is used, crosstalk can occur due to a current leakage between pixels when forming an EL device of a wide area which includes a plurality of pixels. Utilizing a semiconductor material can prevent this drawback of a conductive material with low resistance.

In sum, the use of a material that takes on a high resistance by thermal decomposition is neither disclosed nor suggested by Roitman et al., as defined by independent claim 13.

Further, none of the cited references teaches or suggests a leak prevention layer comprising an organic semiconductor.

IV. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicants submit that claims 13-15, 17-29, and 31-35, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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